FORESTS AND WATER

(Radio Address by E. N. Munns, Chief of Division of Silvics, U. S. Forest Service, in the National Farm and Home Hour, Friday, March 23, 1934)

"Forests and water!" What memories those words call to mind: the deep woods, sunlight and shadow playing on a rocky stream, the voice of a hidden brook, the coolness of a forest spring. Association of delightful woodland scenes with the thought of running water is universal; but just how closely the forest is related to the water supplies of our rivers and of our underground basins is seldom realized.

The forest's great function in regard to water is to bring about absorption of a large part of the rainfall into the soil. So long as this condition is maintained, great quantities of water are stored underground, whence they emerge throughout the year in springs to feed streams and rivers, and in wells. Withdrawal of a large proportion of the rainfall to underground storage reduces the quantity of rain water that runs off the surface of the ground immediately, and thus reduced high-water stages of streams and limits destruction by floods.

Many of us have long been taught that the forest performs this miracle through intercepting rain above the ground level and breaking its impact upon bare soil; through the spongelike absorptiveness of the litter on the forest floor; and through the loosening of the soil by wide-spreading, deeply penetrating roots. That, however, is only a part of the story. It is an interesting part, to be sure. But today let us consider a phase of the forest and water relationship that has come to be understood only within the past few years: the action of the forest in promoting percolation of water into its soil.

When rain falls on bare ground, the water soon becomes muddied. It then carries fine soil particles in suspension downward into the many minute pores in the soil. This fine soil material plugs the pores, sealing them effectively against further percolation. This effect was illustrated in laboratory tests in which clear water was passed through a column of soil. When muddy water was substituted, the rate of percolation was reduced 90 percent, and, when clear water was again used, the reduced rate of percolation persisted. Forest litter keeps the rain that falls to the ground from becoming muddied or displacing the soil particles, and so promotes its absorption in the soil.

Through the agency of animals that trample it and of insects and small animals that burrow into it, and through decay, forest litter gradually disintegrates into humus, or vegetable mold. This enriches the forest soil, making it lighter and more porous. Forest soils are much lighter than agricultural soils.

In studies of the water absorptiveness of soils, use has been made of large tanks of soil and a sprinkling device that makes rain to order. When artificial rain was played on the soil in the tanks at the rate of 1 inch an hour for periods that ranged from 30 minutes to 8 hours, the percentage of the rain that ran off was found to be from 3 to 16 times as great for soil with a bare surface as for similar undisturbed soil.

Somewhat similar experiments were conducted on small plots. On some of the plots the litter was allowed to remain undistrubed; on others, the litter was burned off without otherwise disturbing the soil. It was found that the

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run-off from the denuded plots was more than 50 times that from the litter-covered plots.

In another study the run-off from a burned plot was 100 times that from a plot having a normal cover of forest litter.

Practical proof of these forest and water relationships can be drawn from the histories of some of our floods. During the Yazoo River flood of 1931-32, foresters found that of 27 inches of rain that fell within a few weeks, 62 percent immediately ran off cultivated fields and 54 percent off abandoned fields. During the heaviest rains, from 75 to 95 percent of the rain falling on open ground ran off immediately. In a dense forest, less than one-half of 1 percent of the rainfall ran off; in a scrub oak forest, only 2 percent ran off.

In January, 1934, a heavy storm visited South California from 10 to 18 inches of rain falling in a period of 3 days. All streams from forest-covered slopes overlooking the city rose, but not to such an extent as to do damage or create excitement. However, during the preceding October a fire had completely destroyed the forest on 5,000 acres of steep slopes back of Glendale, a suburb of Los Angeles. From these slopes came a raging torrent that on New Year's Eve killed some 60 persons and damaged property to the extent of $5,000,000. On the unburned slopes, forest growth and its litter had aided in the absorption of the rain; on the burned area, the denuded soils could not absorb the water as fast as it fell and the flood resulted. On the basis of studies made on comparable areas it is estimated that 50 times as much water ran from the denuded lands as from those with a forest cover, and that at the peak of the storm, the maximum rate of run-off from the burned area was 500 times that from the unburned area.

Reasoning from such experimental results and flood histories such as these, we can readily see the great values inherent in the forest's influence on water. If our forests are destroyed by lumbering, by fire, or by over-grazing or are cut to make way for unjustifiable agricultural use of the land, this destruction depletes not only our wood supplies but our water supplies as well. Droughts become more common, wells fail, springs go dry, streams dwindle, rivers become too shallow to navigate, and floods increase in number and severity.

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